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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/682,081	10/10/2003	Young-Hee Jung	053933-5055	9496
9629	7590	09/07/2005	EXAMINER	
MORGAN LEWIS & BOCKIUS LLP			CLARK, SHEILA V	
1111 PENNSYLVANIA AVENUE NW			ART UNIT	
WASHINGTON, DC 20004			PAPER NUMBER	

2823

DATE MAILED: 09/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/682,081

Applicant(s)

JUNG

Examiner

S. V. Clark

Art Unit

2823

pm

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2 and 4-7 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1,2 and 4-7 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date: ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki in view of Hawke et al

Suzuki shows in figure 5A a die 14 having a circuit pattern formed thereon connected to solder balls 15. A printed circuit board 16 is shown for mounting said die and since the a one die is shown formed on what appears to be less than half of the board it is deemed that said board has an area at least %100 as large as the area of the die. Heat sink 19 is shown mounted on the die and an encapsulant 17 (i.e. epoxy-heat conductive) is filled between the printed circuit board and the heat sink and die and printed circuit board. Solder balls 15 are shown formed at the bottom surface of the die and connected to said board.

As Suzuki is deemed to teach the use of conventional epoxy which would obviously include liquid epoxy well known in this art Hawke et al is utilized to specifically show its conventional use and thereby establishing that it would have been obvious to one of ordinary skill in this art to utilize liquid epoxy as one of the conventional epoxies traditionally utilized as encapsulants.

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over

Suzuki in view of Hawke et al and Fortin et al.

Suzuki shows in figure 5A a die 14 having a circuit pattern formed thereon connected to solder balls 15. A printed circuit board 16 is shown for mounting said die and since the a one die is shown formed on what appears to be less than half of the board it is deemed that said board has an area at least %100 as large as the area of the die. Heat sink 19 is shown mounted on the die and an encapsulant 17 (i.e. epoxy) is filled between the printed circuit board and the heat sink and die and printed circuit board. Solder balls 15 are shown formed at the bottom surface of the die and connected to said board.

As Suzuki is deemed to teach the use of conventional epoxy between the heat sink and board and between the die and board (i.e. underfill).

Hawke et al is utilized to specifically show its conventional use and thereby establishing that it would have been obvious to one of ordinary skill in this art to utilize liquid epoxy as one of the conventional epoxies traditionally utilized as encapsulants and Fortin et al teaches use of liquid epoxy underfill (col. 1, line 58).

It would have been obvious to one having ordinary skill in this art that said conventional epoxy would include liquid epoxy, well known in this art for the purpose of enhancing reliability and simplifying the assembly process.

Claims 1, 2, 4, 5, 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al in view of Hawke et al.

Wang et al shows in figure 3 a die 22 having a circuit pattern formed thereon connected to solder balls 26a. A printed circuit board 20 is shown for mounting said die and since the a one die is shown formed on what appears to be less than half of the board it is deemed that said board has an area at least %100 as large as the area of the die. Heat sink 32 is shown mounted on the die and an encapsulant 30 is filled between the printed circuit board and the heat sink. Epoxy 24 is shown filled between the die and printed circuit board. Solder balls 15 are shown formed at the bottom surface of the die and connected to said board. Encapsulant 30 may be formed of epoxy as described in col. 1, line 63 in the contents of 5,285,352 incorporated by reference.

The die is attached to said board by an epoxy adhesive 24.

Figure 4 shows die connection with the use of wire bonding pads 26b and figure 3 shows us of solder balls 26a. Solder balls 28 are also shown formed on the bottom of board 20 for mounting to another board.

As Wang et al is deemed to teach the use of conventional epoxy which would obviously include liquid epoxy well known in this art Hawke et al is utilized to specifically show its conventional use and thereby establishing that it would have been obvious to one of ordinary skill in this art to utilize liquid epoxy as one of the conventional epoxies traditionally utilized as encapsulants.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

Art Unit: 2823

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Hawke et al.

Hawke et al teaches providing dies (see col. 1, line 64-67) on printed circuit board 32 having the dimensional characteristics recited. A heat sink 40 (see col.4, lines 32-34) is mounted on the die and a liquid encapsulant 16 is taught to be formed between the board and the printed circuit board. Solder balls 38 are shown formed on the bottom surface of substrate 32.

Claims 1, 2, 4, 5, 6-7 are rejected.

Applicant's arguments filed 6-23-05 with respect to the claims have been considered but are not deemed to be persuasive. Contrary to applicant's assertion, heat sinks are generally mounted on packages to radiate heat from dies. The heat sink of Hawke et al forms such a function. Applicant does agree that the Hawke et al does teach that said chips 14 may be microchips. Said chips are shown to have a lid which is a heat sink and heat sink are generally formed on chips through some sort of interface material which in this case is resin 36 similar to the interface material 314 formed between the die and heat sink of the instant invention. Further the claims recite that the heat sink is mounted on the die which fails to exclude intervening materials.

The rationale for the heat sink "on" the die expressed above is extending to the teaching of Suzuki. Further Col.4, line 12-13 of Suzuki specifically teach that "heat generated from the ...chips.... is transmitted to heat radiation fins 20 by way of the

Art Unit: 2823


metal enclosure..19". Which teaches that said enclosure has a heat dissipation (heat sink) function.

The arguments above are extended to Wang.

As the references are deemed to teach the use of epoxy in the area recited it is deemed that the type of epoxy used may be "liquid epoxy" which is clearly taught to be conventional and commercially utilized.

Further heat sinks formed on chips are very well known in this art.

Any inquiry concerning this communication should be directed to S. V. Clark at telephone number (571) 272-1725.


S. V. Clark
Primary Examiner
Art Unit 2823

September 5, 2005